DOCUMENT RESUME

ED 404 461 CE 073 392

TITLE	Changes in Math Anxiety Levels.
INSTITUTION	Montclair State Univ., Upper Montclair, NJ. Career Equity Assistance Center for Research and Evaluation.
SPONS AGENCY	New Jersey State Dept. of Education, Trenton. Office of Bilingual Education and Equity Issues.
PUB DATE	95
NOTE	6p.
PUB TYPE	Collected Works - Serials (022)
JOURNAL CIT	New Jersey Research Bulletin; n10 Spr 1995
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Adult Education; Adult Programs; *Attitude Change; Comparative Analysis; *Displaced Homemakers; *Mathematics Anxiety; *One Parent Family; *Outcomes of Education; Pretests Posttests; Program Effectiveness; *Sex Differences; State Surveys; Vocational Education
IDENTIFIERS	Carl D Perkins Voc and Appl Techn Educ Act 1990; *New Jersey

ABSTRACT

The effectiveness of seven Perkins Act-funded single parent/displaced homemaker programs throughout New Jersey in reducing clients' math anxiety was evaluated through a pretest and posttest designed to determine level of math anxiety. During the 1993-94 school year matched pretest and posttest scores were obtained for 98 of the 177 individuals tested at the 7 sites. As a group, the participants demonstrated a statistically significant decrease in level of math anxiety (group means of 234.07 and 213.48 on the pretest and posttest, respectively). The mean posttest score of the female participants (213.48) was significantly lower than their mean pretest score (234.07), which indicated a decrease in math anxiety after program participation. The males also had a lower mean test score (224) compared to their pretest score (230.09); however, the difference was not significant. The males' mean pretest score was lower than the females, which indicated that the males had a lower initial level of math anxiety. On the posttest, the situation was reversed. The females' mean posttest score was lower than the males' mean posttest score, thus indicating that, after participation in the single parent/displaced homemaker programs, the females had less math anxiety than their male counterparts. (Contains 25 references.) (MN)

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ED 404 461

CHANGES IN MATH ANXIETY LEVELS
RESEARCH BULLETIN NO. 10

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NEW JERSEY
CAREER EQUITY ASSISTANCE CENTER FOR RESEARCH AND EVALUATION

SPRING, 1995 LIFE SKILLS CENTER, MONTCLAIR STATE UNIVERSITY RESEARCH BULLETIN No.10

CHANGES IN MATH ANXIETY LEVELS

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The Office of Bilingual Education and Equity Issues of the New Jersey Department of Education through funding from the Carl D. Perkins Act sponsors single parent/displaced homemaker programs throughout the state. One goal of these programs is to provide marketable skills training in areas which produce economic self sufficiency. Because of the importance of mathematics in many career paths, reduction of barriers to success such as math anxiety is crucial to these programs. This study evaluated the changes in math anxiety that occurred as a result of program participation. Math anxiety decreased for all participants and for females in the programs.

Projects for single parents/displaced homemakers are required to provide marketable skills training in areas which produce economic self sufficiency. Because mathematical competence is increasingly important to maintaining employment, project goals include decreasing math anxiety of participants as a component of a comprehensive program. This study evaluated the effectiveness of projects for single parent/displaced homemakers in changing math anxiety levels of project participants.

REVIEW OF LITERATURE

The effects of anxiety on learning and performance have been recognized for some time (Levitt, 1980). More specifically, the effect of math anxiety, not intellect, as a road block to successful math performance in both academic settings and in everyday life has been examined (Tobias,1991; Gourgey, 1984). The effects of math anxiety as a road block to successful math performance can be life long. A strong background in mathematics is critical for many career and job opportunities in today's increasingly technological society (Meece, Wigfield and Eccles, 1990). Only half of all high school graduates enrolled in math courses beyond the tenth grade (National Assessment of Educational Progress, 1988; National Center for Educational Statistics, 1984). Fewer women than men enroll in any math course beyond the tenth grade or in the more advanced courses in high school, such as trigonometry or calculus.

Gender differences in math performance probably do not occur until adolescence and are then most pronounced for measures of problem solving (Leder, 1990). High math anxiety has been related to lower confidence (Fennema and Sherman, 1976) and to lower performance (Engelhard, 1990). Population groups likely to have higher levels of math anxiety include women (Tobias, 1991; Eccles and Jacob, 1986; Wigfield and Meece, 1988), minorities (Tobias, 1991), older students

(Betz, 1978) and students with inadequate math backgrounds (Betz, 1978).

The concept of math anxiety includes a number of related concepts, including math self-concept and self-esteem (Gourgey, 1984), math attitude (Adams and Holcomb, 1986), numeric anxiety (Kagan, 1987) and test anxiety (Green, 1990). Differences in math anxiety levels between males and females have been reported by several researchers (Eccles and Jacobs, 1986; Tobias, 1991; Tocci and Engelhard, 1991; Wigfield and Meece, 1988). Among undergraduate college students, gender differences were significant on 2 of 3 different measures (Dew, Galassi and Galassi, 1983). In all cases, females displayed more anxiety than males. Among students in grades 6 through 12, girls reported experiencing more negative affective reactions to math than did boys (Wigfield and Meece, 1988). Gender differences existed at each grade level and were significant for students in the 6th, 7th, 9th and 11th grades.

In a 2 year longitudinal study of students in the 7th through 9th grades, girls reported higher levels of math anxiety than did boys (Eccles and Jacob, 1986). Math anxiety appeared to be an important predictor of subsequent math grades and course plans. Math anxiety was directly and strongly influenced by social factors, particularly by mothers' beliefs concerning the difficulty of math for their children.

Other researchers have found little or no difference in math anxiety based on gender (Meece, Wigfield and Eccles, 1990; Cooper and Robinson, 1989). Boys and girls in the 7th through 9th grades differed slightly in the amount of anxiety that they reported, but the effect on predicting achievement was similar (Meece, Wigfield and Eccles, 1990). In a meta-analysis of previous studies, Hyde, Hennema, Ryan, Frost, and Hopp (1990) found that gender differences in mathematics attitude and affect were small and similar to differences in mathematics performance. When differences did exist, females generally held more negative attitudes. On a related measure, males stereotyped mathematics as masculine considerably more than females did (Hyde et al., 1990; Tocci and Engelhard, 1991). Because the size of the difference was quite large, Hyde et al. (1990) proposed that possibly the pressure of male views was more responsible for discouraging females in math-related careers than was math anxiety.

Levels of math anxiety vary depending upon the age of the subjects (Reilly, Coté-Bonanno and Bernstein, 1992; Wigfield and Meece, 1988). When math anxiety levels were determined for students in the 5th through 12th grades, the highest levels of anxiety were reported in the 9th grade and the lowest levels of anxiety in the 6th grade. The lack of math anxiety for the 6th graders was attributed to a lower level of competition in the elementary school.

In a study of traditional and nontraditional students, the majority reported moderate levels of math anxiety. Age was found to be significantly related to anxiety, with the lowest levels of anxiety among those students who were 14 and 17 years of age. When math anxiety for males and females was examined by age, differences became apparent. Females had lower levels of math anxiety than boys at age 12, similar levels at age 13 and higher levels of math anxiety than boys at age 14. Females reported higher math anxiety levels than males until 20 years of age (Reilly, Coté-Bonanno and Bernstein, 1992).

Students following different career paths have reported different levels of math anxiety (Hyde et al., 1990; Reilly, Coté-Bonanno and Bernstein, 1992). In a meta-analysis of previous studies, Hyde et al. (1990) found that gender differences in math anxiety were largest for students enrolled in remedial mathematics classes as compared to students in general or selective math classes. Students in traditional career options were significantly less anxious about their abilities in math than those in nontraditional career options (Reilly, Coté-Bonanno and Bernstein, 1992).

Many different approaches have been used to reduce math anxiety. These have included group anxiety reduction programs combined with assertiveness training (Tobias, 1991), one-to-one tutoring (Skiba, 1990); small group work combined with concrete modeling of concepts (Larson, 1983), systematic desensitization (Waddlington, Austin and Bitner, 1992) and problem-solving/ group interaction workshops (Amodeo and Emslie, 1985; Tobias, 1991). Instructional methods and techniques have also been shown to affect math anxiety (Clute, 1984; Green, 1990).

PROCEDURE

Data was collected from participants in seven projects for single parent/ displaced homemakers throughout New Jersey. During the 1993-94 school year pre tests and post tests were collected from 177 adults enrolled in the projects.

The MARS-A version which was developed specifically for use with adolescents was utilized in this study (Suinn

and Edwards, 1982).The response to each item of the MARS-A was scored from 1 to 5, with 1 indicating the least anxiety and 5 the most anxiety. Possible scores could range from 98 reflecting the lowest anxiety level for each item to 490 reflecting the highest anxiety level.

The sample was ninety percent female and ten percent male. No other data describing the sample was available.

TEST VARIABLE

Scores on pre and post tests could be matched for only 98 cases although 177 students participated in the testing.

For all participants, the decrease in the mean score of 233.91 on the pre test to 217.75 on the post test was statistically significant. The decrease in mean score reflected a decrease in math anxiety after participation in a single parent/displaced homemaker project. (See Figure.)

RELATIONSHIPS BETWEEN VARIABLES

The mean post test score (M213.48) for females was significantly lower than their mean pre test score (M234.07), indicating a decrease in math anxiety following program participation. Males also had a lower mean post test score (M224) compared to their pre test score (M230.09), but the difference was not significant.

The mean pre test score for males (M230.09) was lower than the mean pre test for females (M234.07), reflecting a lower level of math anxiety. This difference was reversed for the post test scores. The mean post test score for females (M213.48) was lower than the mean post test score for males (M224), reflecting less math anxiety.

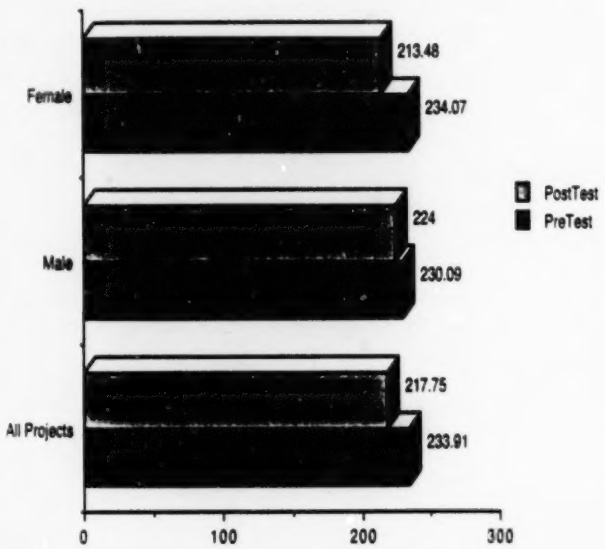
DISCUSSION AND CONCLUSIONS

The projects for single parent/displaced homemaker women met their goal of decreasing the math anxiety level of participants. Decreases were significant for total participants and for females. Math anxiety scores for males also decreased, but not significantly.

Females had higher levels of math anxiety than males on pre test scores, as reported by other researchers (Dew, Galassi and Gallassi, 1983; Eccles and Jacobs, 1986; Tobias, 1991; Lent, Brown and Larkin, 1984; Wigfield and Meece, 1988). However, since math anxiety scores decreased significantly for females, but not for males, the post test math anxiety scores were lower for females than for males. Perhaps male stereotyping of math as a masculine domain (Hyde et al., 1990) makes attitudes more resistant to change for males than for females.

Clute (1984) categorized scores on the MARS inventory as high anxiety (282 and over), medium anxiety (200-281) and low anxiety (199 and under). Using these categories, all respondents in the current study had moderate levels of math anxiety. Females decreased their anxiety level as a result of participation in a single parent/displaced homemaker project, but the mean was still within the medium anxiety category. Since Tobias (1991) successfully reduced math anxiety by allowing participants to continue in the program on an as needed basis, continued participation in single parent/displaced homemaker projects could decrease anxiety levels further. The effect of duration of participation on math anxiety level needs further research.

Participants in single parent/displaced homemaker projects are all nontraditional students. Because nontraditional students have been found to have high math anxiety levels (Reilly, Coté-Bonanno and Bernstein, 1992), the reduction of math anxiety is of particular importance to this target population. With the increased skills in mathematics necessary for many career and job opportunities in today's society (Meece, Wigfield and Eccles, 1990), the reduction of math anxiety due to participation in the projects for single parent/displaced homemaker women is an important component of the overall goal of reducing barriers to attaining marketable skills.



Comparison of Scores on the MARS-A

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